

ECHI-T: Large bio-ethanol project from Sweet Sorghum in China and Italy

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Introduction

Sweet Sorghum is a promising crop for biomass production because of its high yield and possibility to produce a range of high added value products like ethanol, energy and DDG (distilled dried grains). After harvesting, Sweet Sorghum can be separated in **grains** (used for DDG and ethanol production), **sugar juice** (extracted from the cane and used for ethanol production) and **bagasse** (used for energy production). Other products are CO₂ from fermentation, paper from bagasse or compost from roots. A simplified scheme summarising Sweet Sorghum processing is presented in the following figure:

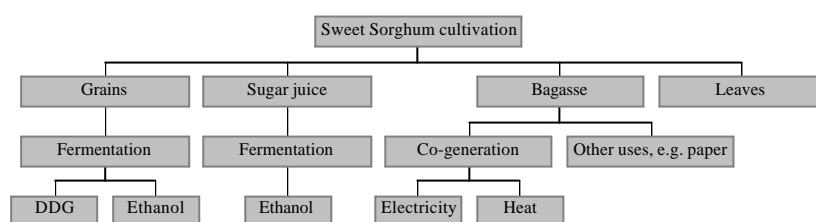


Figure 1: Simplified Sweet Sorghum process scheme

Products have a low environmental impact because Sweet Sorghum is a renewable resource (no net CO₂ emissions). Bio-ethanol can be used in the transport sector reducing emissions considerably through gasoline reformulation. Furthermore implementation of integrated Sweet Sorghum processing will provide a sustainable food/feed resource (DDG) and will increase jobs and decentralised renewable energy production in rural areas. Previous studies show that sustainable commercial integrated processing from Sweet Sorghum can be feasible today.

Aim

The aim of the ECHI-T project is the elaboration of a technical, economical, financial and environmental feasibility study on integrated bio-ethanol/bio-electricity/DDG-production from Sweet Sorghum able to attract private capital investors (bank pool) for its good economics. The study will be carried out for three existing sites selected for their good realistic implementation perspectives:

- Dongying City region in Shandong Province, China (± 70.000 ha)
- Huehaote City region in Inner Mongolia, China (± 60.000 ha)
- Municipality of Pisticci in Basilicata region, Italy (± 7.000 ha)

These sites have been selected because of various favourable conditions i.e. climate (Dongying, Basilicata), existence of (oil-) refineries in the region that can serve as a market for bio-ethanol (Dongying, Basilicata) and experience with Sweet Sorghum cultivation (Huehaote). The main result of the project will be the definition of the plant configuration (i.e. from the receipt of the biomass at the plant gate to the products supply) and evaluation of the whole biomass chain (production of Sweet Sorghum to market for the products - ethanol, power, DDG, etc.) for the three sites. The study will be an on site application using existing commercial technologies.

Work carried out

The main objectives of the ECHI-T project are the following:

- Selection of the Sweet-Sorghum varieties for South Italy and China for bioethanol production, identification of their respective productivity and sustainable plantation schemes; identification of local market values of sweet-sorghum components, i.e. grain, sugar juice, bagasse;

- Identification of a possible configuration for the three bio-ethanol/bio-electricity/DDG complexes as well as the commercial technologies needed;
- Identification of the capacity of the plants and the suitable logistics to supply the feedstock for the production of bio-ethanol, heat, power, DDG,
- Evaluation of the required investments;
- Preliminary elaboration of a “project-financing plan” for procurement of financing,
- Evaluation of the marginal-cost of bioethanol and selling value of the different products (China - Italy);
- Preliminary environmental impact assessment for the projects
- Man-power (jobs) requirements and professional profiles
- The possible conversion of bio-ethanol into ETBE will also be considered

Partners

The ECHI-T project is carried out by a large consortium of partners to assure that all competences needed are represented in the project. Project partners are:

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|-----------------------------|---|
| - ETA (Italy, co-ordinator) | - Sorghal (Belgium) |
| - COTEI (Italy) | - EUBIA (Belgium) |
| - Siemens (Germany) | - Energidalen (Sweden) |
| - WIP (Germany) | - Harold Wouters S.p.r.l. (Belgium) |
| - BAFF (Sweden) | Chinese partners: |
| - DeltaT (US) | - China Rural Energy Industry Association CAREI (China) |
| - ISCI (Italy) | - Beijing E&E Biomass Development Ltd. (China) |

Benefits

Main benefits of the ECHI-T project are:

- Promotion of an economically feasible production system for a clean alternative fuel from domestic renewable resources
- Environmental benefits: zero overall CO₂ emissions, and lower pollutant emissions in urban areas when bio-ethanol is used in the transport sector
- Job creation, especially in rural areas
- Decentralised energy production for remote areas
- In China large experience with Sweet Sorghum production and use for feed/food or decentralised ethanol production exist (1,8 million ha). Chinese expertise will be transferred to Europe and the US. On the other hand European and US technology for advanced Sweet Sorghum processing (fermentation technology, co-generation, DDG production) will be introduced in China offering possibilities for Chinese development and new markets for European and US industries.
- Many possibilities for technology spin-off to other areas
- Basis for future CO₂ trade off and negotiation

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